Argonne NATIONAL LABORATORY

Nuclear Engineering

Research and Test Reactor Conversion

The U.S Department of Energy (DOE) initiated the Reduced Enrichment for Research and Test Reactors (RERTR) Program in 1978 to develop the technology necessary to reduce the use of HEU fuel in research reactors by converting them to low enriched uranium (LEU) fuel. Today the RERTR is an integral part of the Global Threat Reduction Initiative (GTRI), a program established by the U.S. DOE's National Nuclear Security Administration (NNSA) to secure radiological and fissile materials worldwide. A total of 129 reactors are included in the scope of the Program.

The main technology components of the program are:

- the development of advanced LEU fuels,
- design and safety analysis for research reactor conversion, and
- development of targets and processes for the production of the medical isotope Molybdenum-99 with LEU.

LEU fuel with much greater uranium content, to compensate for the reduction in the content of U235 in the LEU material, is needed to enable the conversion of research reactors. Several high density LEU fuels have already been developed. The RERTR program developed the uranium disilicide dispersion fuel. An accelerated fuel development and qualification program focusing on U-Mo alloy fuel is currently underway with the objective of qualifying very high density LEU fuels to enable the conversion of high performance research reactors that are not convertible with the existing qualified fuels.

The conversion analysis and support activity provides the required analytical and design evaluations. Since the inception of the RERTR program, analysis methods and codes have been developed specifically for the analysis of research reactors. The methods and codes are currently evolving to incorporate the latest tools and data and have been validated with experimental data.

The Reactor Conversion program mission supports the minimization and, to the extent possible, elimination of the use of High Enriched Uranium (HEU) in civil nuclear applications by working to convert research reactors and radioisotope production processes to the use of Low Enriched Uranium (LEU) fuel and targets throughout the world.

Analyses are performed to determine a suitable LEU fuel assembly design and core configuration for each reactor, with the objective of ensuring the conversion occurs with no significant negative impact on the operation characteristics (experiment and fuel performance) of the reactor. It must also be demonstrated that transition from HEU to LEU fuel can be done safely and without interrupting normal operations

The objective of the technology development for Mo^{99} program element is to eliminate the use of HEU targets in production of Mo^{99}. The program intends to accomplish this objective through the development of LEU targets and chemical processing methods that do not adversely impact the isotope production yields, costs and waste treatment and disposal with respect to current production with HEU targets.

Since the inception of the program, 51 of the 129 candidate reactors have been converted to LEU fuel or have been shut down prior to conversion. The current goal is to convert the remaining 78 reactors by the year 2018. Of the remaining reactors, 50 can be converted with existing LEU fuels, the high density UMo fuel under development will allow the conversion of 19 additional reactors, and the remaining 9 reactors require further analysis.

For additional information, please visit ***http://www.rertr.anl.gov***, or contact Jordi Roglans at roglans@anl.gov.